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**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

**Examiner:** ESHETE, Zelahim

**Docket:** MB 390

**Applicant(s):** Jens Meintschel

**Serial No.:** 10/809293

**In Response to Paper No.** 12222004

**Filing Date:** 25/03/04

**Art Unit:** 3748

**Title:** DEVICE FOR THE RELATIVE ANGULAR ADJUSTMENT OF A  
CAMSHAFT WITH RESPECT TO A DRIVE WHEEL

Commissioner for Patents  
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3 pages

March 21, 2005

**SIR:**

This is in response to the official action dated 01/04/05.

The Examiner has rejected claims 1 - 3 and 5 of the present application under 35 USC 103(a) as being unpatentable over Axmacher et al. (US 6 523 512) in view of Yu.

Axmacher et al. (US 6 523 512) discloses a control arrangement for adjusting the angle of rotation of a camshaft relative to the angle of rotation of a crankshaft of an internal combustion engine for controlling valve timing. The arrangement includes a wobble plate mechanism wherein the wobble plate is in engagement on one hand with a gear ring 2.2 of a camshaft drive wheel 2 and on the other hand, a gear ring 1.2 which is connected for rotation with the camshaft 1 for driving the camshaft via the wobble plate 3. For changing the rela-

tive angular position between the camshaft wheel 2 and the camshaft an actuator 5 is rotated so that the wobble plate 3 is "wobbled" whereby the relative angular positions are changed.

Yu (US 4 850 247) discloses a planetary high transmission ratio gearing for use in place of worm gears or multi-stage gear reducers. It includes an input shaft 12 with a sun gear 1 which is in engagement with a planetary gear 4 that rolls along the housing gear ring 2 when the input shaft is rotated. It also rolls along the gear ring 3 which is connected to the output shaft 11. The output shaft gearing 3 has a number of teeth which is different from that of the housing gear ring 2 so that the output shaft rotates at a greatly reduced speed. If for example the housing gear ring 2 has 100 teeth and the output shaft gear ring 3 has 99 or 101 teeth, the output shaft rotates once in the same direction as, or respectively the opposite direction of, the input shaft with every 100 turns of the input shaft so as to provide a transmission ratio of 100 to 1.

The present invention relates to a relative angular adjustment device for a camshaft 4 of an internal combustion engine with respect to a drive wheel 6 driving the camshaft 4. In contrast to Axmacher et al., an epicyclic gear structure 16 is used which includes a drive-side ring wheel 7 connected to the drive wheel 6, a planet wheel 8 and a central sun wheel 9, and an actuating means 12 is connected to the central sun wheel 9 for adjusting the angular position of the drive-side ring wheel 7 relative to the camshaft 4 or, respectively, the output side ring wheel 10 to which the camshaft is connected and which is in meshing engagement with the planet wheel 8 and has a number of teeth different from that of the drive-side ring wheel 7.

This arrangement is substantially more reliably than the arrangement of Axmacher et al. in that no wobble plates are required which are subjected to relatively high, one-sided, axial forces and therefore require heavy bearing structures. Furthermore, the nested gear arrangement of the arrangement according to the present invention requires little space and can be relatively small as all radial gear transmission forces cancel each other in the same radial plane.

The Examiner alleges that it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Axmacher's device by replacing the "planet wheel" and "sun wheel" with planet gear and sun gears as taught by Yu.

However, such a substitution, that is, the replacement as suggested by the Examiner would not result in the arrangement according to the invention. Of course, epicyclic gear structures are known but there is more to the arrangement according to the invention than just substituting Yu's epicycle gear structure for that of Axmacher et al. The change suggested by the Examiner can actually not be done without substantial inventive contribution, not even in hindsight, that is with the knowledge of a desirable application. The Examiner is invited to think his suggestion over and came up with a solution how Yu's high transmission ratio gear could be used or even modified so as to be incorporated in Axmacher et al. to arrive at the arrangement according to the present invention. It is not possible; not without additional features and additional thoughtful considerations, not even in hindsight knowing that the aim is to arrive at the arrangement according to the present invention that is knowing exactly the structure which to aim at.

It is therefore respectfully asserted that the device for the relative angular adjustment of a camshaft with respect to a drive wheel as defined in claim 1 of the present application is not only novel, but also unobvious in view of the art cited by the Examiner and the Examiner is respectfully requested to reconsider his rejection of claim 1 under 35 USC 103.

Claims 2, 3 and 5 relate to particular features which are considered to be advantageous in connection with the device as defined in claim 1 so that these claims should be patentable together with claim 1. Claim 4 has already been indicated by the Examiner to be allowable. As it is believed that the Examiner will agree that claim 1 is allowable, claim 4 depends on an allowable claim, so that it too should be allowable.

Reconsideration of claims 2 to 5 is respectfully requested and allowance of claims 1 to 5 is solicited.

Respectfully submitted,



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